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Autonomous robotics

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Essay

This is a longer essay exercise, that wins you triple bonus points according to the rules. Hand in your essay on Thursday, the 22nd of June, 2017. The essay can be written in English or German.

Read the paper by Ed Large, H. I. Christensen, and R. Bajcsy. Scaling the dynamic approach to path planning and control: Competition amoung behavioral constraints. *International Journal of Robotics Research*, 18(1):37–58, 1999 (available on the web page).

In a first reading, ignore problems you have comprehending, only look up words critical to your understanding, try to get a picture of the whole article first. Mark passages you don't understand (but don't work through them yet), underline points you do understand and find important. Try to gain an understanding of what the components of the paper are.

1. Only then write down a short summary of what you think are the main goals of the paper. This is the first point of the essay. You will do best to first write a draft of this summary and then come back to this summary later, revising it as your understanding of the paper improves while you do the next two tasks.

2. Focus now on the dynamics listed in Equation (10). This is a different from of competitive dynamics than the neurally motivated one presented in the lectures. Based on the text, describe the different dynamic regimes with the relevant attractor states as a function of the parameters α_i. This will be a description in English of a mathematical analysis reported in the paper (summarized in Table 1) that you don't need to reproduce. Illustrate this description using a bifurcation diagrams. You may simplify the equations to just two activation variables to make the description easier. Can you compare the competitive dynamics used here to the neural dynamics of two competing neurons (that's a bonus question)?

3. The interaction between target acqusition and obstacle avoidance is discussed in Section 3. Decribe in words the meaning of the competitive interaction as defined in Equations 12, 13, and 14 and of the competive advantage as defined in Equation 15. This should lead to a description of the situations in which the two constraints should compete and which constraint should "win" in which situation.